

REMARKS

Upon entry of the claim amendments present herein, claims 1, 5, 6, and 10-14 are pending in the application. Claims 3, 4, 7 and 9 have been cancelled. Claims 1, 10 and 11 have been amended. Support for the amendments can be found in the specification, claims, and Figures, e.g., Figure 7 as filed. Claims 12-14 are new. Support for the new claim can be found in the specification, claims, and Figures, e.g., page 13, line 19 – page 14, line 5; page 17, lines 1-9; and page 19, line 15. No new matter has been added.

The presentation of the foregoing amendments should in no way be construed as an acquiescence to any rejections, and is done solely to point out more particularly and distinctly claim the subject matter that Applicants believe to be their invention, and to expedite prosecution. Applicants reserve the right to pursue the claims as previously presented in this or a separate application(s).

The Invention

The present invention provides optical data recording media which are resistant to deformation (e.g., warp) due to changes in humidity levels. Thus, the present invention provides optical data recording media which are resistant to warpage or deformation induced by changes in relative humidity. More particularly, the present invention provides optical data recording media in which the expansion coefficient under humidity of the protective film and the transparent substrate are regulated to prevent a bending force that can induce a warp or bend in the medium.

For example, as recited in claim 1, in one embodiment an optical data recording medium includes a three-layered structure, including a transparent substrate, a thin film layer formed on the transparent substrate and a protective film which is mainly comprised of a resin and formed on the thin film layer for protecting the thin film layer. According to the invention, warping of the medium due to changes in humidity

is suppressed by reciting a relationship between the expansion coefficient under humidity of the protective film, and the expansion coefficient under humidity of the transparent substrate. By balancing the bending moments of the transparent substrate and the protective layer, warping due to changes in humidity is suppressed. In this embodiment, an expansion coefficient under humidity of the protective film is greater than that of the transparent substrate, and is smaller than 5.5×10^{-5} (1/%).

In another embodiment, as recited in new claim 12, an optical data recording medium includes a transparent substrate, a thin film layer formed on the transparent substrate and a protective film which is mainly comprised of a resin and formed on the thin film layer for protecting the thin film layer. In this embodiment, the expansion coefficient under humidity, Young's modulus and thickness of the protective film are suitably adjusted so that the bending moments of the transparent substrate and the protective film generated by change in humidity are balanced with a neutral plane being a plane perpendicular to the film thickness direction and the position of the neutral plane is arranged within the thin film layer.

In still another embodiment, as recited in new claim 14, an optical data recording medium consists essentially of a transparent substrate, a thin film layer formed on the transparent substrate and a protective film which is mainly comprised of a resin and formed on the thin film layer for protecting the thin film layer. In this embodiment, the expansion coefficient under humidity of the protective film is greater than that of the transparent substrate and smaller than 5.5×10^{-5} (1/%) and the thickness of the protective film is 5 μm to 20 μm .

The Cited References

As described in more detail below, none of the prior art references alone or in combination teach or suggest preventing humidity induced warpage of an optical data recording medium which comprises a transparent substrate, a thin film layer formed on the transparent substrate and a protective film formed on the thin film layer wherein the protective film is composed of a resin, and wherein the expansion

coefficient under humidity of the protective film is greater than that of the transparent substrate and the expansion coefficient under humidity of the protective film is less than $5.5 \times 10^{-5} (1/\%)$, as required by pending claims 1, 5, 6, 10-11, and 13-14. The term "expansion coefficient under humidity" is defined in claim 1 to be the [ratio of expansion (1/%) where a difference of relative humidity (vapor content/saturated vapor amount at 25°C) is increased by 1%].

Furthermore, Applicants contend that none of the prior art references, alone or in combination, teach or suggest an optical data recording medium in which the expansion coefficient under humidity, Young's modulus and thickness of the protective film are suitably adjusted so that the bending moments of the transparent substrate and the protective film generated by change in humidity are balanced with a neutral plane being a plane perpendicular to the film thickness direction and the position of the neutral plane is arranged within the thin film layer, as recited by new claim 12.

Rejection of claims under 35 U.S.C. §102(b)

Claims 1, 3-7, and 9-11 were rejected under 35 U.S.C. §102(b) as being allegedly anticipated by Tajima (JP 2000-311381). As noted above, claims 7 and 9 have been cancelled, and the rejection of these claims is moot. As to the remaining claims, the rejection is traversed.

The Office Action again asserts that the embodiments recited in Table 5 of Tajima satisfy the limitations of the instantly claimed invention and that "the data in the tables establishes this." Applicants respectfully disagree. Table 5 of the Tajima reference recites film thickness, Young's Modulus, Linear Expansion Coefficient and Moisture Permeation Degree. The Tajima reference is *silent* concerning expansion coefficient of humidity.

The parameter "expansion coefficient under humidity" is a parameter that is not the same as moisture permeation degree ($\text{g}/\text{m}^2 \cdot \text{day}$) and the water absorption (%). The

present specification particularly points out the intended meaning of “expansion coefficient under humidity” at page 5, lines 22-24, in such terms that the expansion coefficient under humidity parameter is different from moisture permeation degree, and water permeability. Although the Examiner states (without any additional proof) that “if the degree of water absorption is low, the coefficient of expansion due to humidity will also be low,” (Office Action at page 4), Applicants do not agree that the relationship is necessarily as simple as the Examiner asserts.

Tajima neither discloses nor suggests a substrate film or a protective film of an optical recording media which has an expansion coefficient under humidity of less than $5.5 \times 10^{-5}(1/\%)$. Moreover, while Tajima does mention variations in camber-angle when humidity is changed, Tajima does not teach or suggest preventing humidity induced warpage or deformation by controlling the magnitude and ratio of the expansion coefficient under humidity of the protective layer or the transparent substrate. The four-layer structure disclosed by Tajima (e.g., in Figure 1) corresponds to a conventional medium as described for Comparative Example 1 of the present specification, which, as mentioned below, has an expansion coefficient under humidity of $6.25 \times 10^{-5}(1/\%)$.

The Examiner states that:

the linear expansion coefficients and Young's modulus are relatively unimportant by themselves. As the desire to reduce warping of the media is the intended/desired result, the applicant might find including any limitations found in the specification with respect to the warpage or tilt into the claims to distinguish over less desirable media with high warpage/tilt.

Office Action at page 3.

This statement is not understood. Applicants have discovered that warpage can be suppressed by appropriate selection of the properties of the thin film and protective film layers of an optical recording medium. The expansion coefficient under humidity is one of the properties to be optimized; this is not “relatively unimportant”; rather, the appropriate selection of these properties is crucial.

The Examiner also states that the Comparative Example in the present specification meets the claim limitations (concerning humidity expansion coefficient). This statement is traversed. As noted above, pending claims 1, 5, 6, 10-11 and 13-14 all recite that the protective film of an optical recording media has an expansion coefficient under humidity of less than $5.5 \times 10^{-5}(1\%)$. The Comparative Example to which the Examiner points describes a protective film having an expansion coefficient under humidity of $6.25 \times 10^{-5}(1\%)$, which is not within the recited range of claims 1, 5, 6, 10-11 and 13-14).

The Office Action has reasserted the argument that “the humidity expansion coefficient is an inherent property of the material and that the protective layer of the prior art cited inherently meets this limitation.” Office Action at page 3. The Office Action goes on to state that

“The examiner notes the materials disclosed in the instant application urethane, epoxy, polyester and polyether acrylates are disclosed as useful and meeting the material limitation of the claims in the instant specification...”

The Examiner appears to take the position that all urethane, epoxy, polyester and polyether acrylates which can be used in optical recording media inherently possess expansion coefficient under humidity values specified in the pending claims. Moreover, the Office Action appears to aver that because warping or tilting in the optical recording media is bad, that any prior art optical recording media which is designed to prevent warp or tilt caused by any stimulus automatically must also satisfy the claim limitations of the instant application.

Applicants do agree that the expansion coefficient under humidity is an inherent property of a material. However, as Applicants have pointed out previously, a mere assertion that a property is inherent is insufficient to prove that a reference is anticipatory. Although Applicants agree that certain urethane, epoxy, polyester or polyether acrylate materials are useful in the present invention, the pending claims further require that each material used in the protective layer or the transparent

substrate possess specified values for the expansion coefficient under humidity. Thus, the instant invention contemplates fabrication of the transparent substrate and protective layer from materials such as urethane, epoxy, polyester or polyether acrylate materials (or polyolefin or polycarbonate) which possess the requisite expansion coefficient under humidity (e.g., as specified in independent claims 1, 10 and 14 and the claims dependent therefrom). While the Examiner states that “urethane, epoxy, polyester and polyether acrylates are disclosed as useful and meeting the material limitation for the protective layer,” Applicants contend that the instant specification does not suggest that all polyester, epoxy, urethane or polyether acrylates are useful in the present invention. Rather, the present specification teaches that those materials meeting *specified limitations* of expansion coefficient under humidity (and in certain claimed embodiments, Young’s modulus) are useful in the claimed invention.

The claimed invention provides that the material of the protective film has an expansion coefficient under humidity value greater than that of the transparent substrate and that the expansion coefficient under humidity of the protective film is smaller than 5.5×10^{-5} (1/%). As disclosed by the present specification, optical data recording media which satisfy the above requirements are particularly resistant to deformation or warpage caused by changes in humidity.

It is well-established that a claim is anticipated only if each and every element or feature of a claim is expressly or inherently described in a single prior art reference. See, e.g., MPEP 2131. In the present case, the Examiner appears to agree that the Tajima reference does not expressly disclose all the elements of the presently-claimed invention. For a reference to inherently disclose a feature not expressly disclosed, extrinsic evidence can be used to supply the missing feature only if the extrinsic evidence “make[s] clear that the missing descriptive matter is *necessarily present* in the thing described in the reference and that it would be so recognized by persons of ordinary skill in the art. Inherency, however, may not be established by probabilities or possibilities.” MPEP 2112(IV), citing *In re Robertson*, 169 F.3d 743, 745 (Fed. Cir. 1999) (citations omitted) (emphasis added).

However, the Office Action has not provided any *extrinsic* evidence that the optical recording media of Tajima disclose *all the features* of the claimed invention, or that persons of ordinary skill in the art would recognize that *all the features* of the claimed invention are present in the Tajima reference. See, e.g., MPEP §2131.01, Heading III citing *Continental Can Co. USA v. Monsanto Co.* 20 USPQ2d 1746 (Fed. Cir. 1991).

Tajima neither discloses nor suggests imposing such a performance requirement on the materials used for the optical recording medium recited therein. Moreover, no extrinsic evidence has been presented to show or establish that the protective layers or transparent substrates of the optical recording media of Tajima necessarily possess the expansion coefficient under humidity recited in claims 1 and 10 (and the claims dependent thereupon), as currently amended.

Applicants respectfully submit that the materials disclosed in the Tajima reference do not necessarily possess the properties of the claimed invention. Materials described in similar general terms can and often do have quite different properties, including different expansion coefficient under humidity. It is clear that a reference disclosing a urethane acrylate, epoxy acrylate, or polyester or polyether acrylate would not necessarily provide a disclosure of a material having the claimed expansion coefficient under humidity. Indeed, Applicants have provided evidence to this effect (see the discussion of the Tachibana reference, *infra*). Therefore, the Tajima reference does not and cannot anticipate the pending claims.

For at least the reasons discussed herein, Applicants urge that claims 1, 5, 6, 10-11 and 13-14 are patentable over the Tajima patent. Applicants further contend that claim 12, which recites balancing the bending moments of the transparent substrate and the protective film and describes the positional relationship between the neutral plane and the thin film layer, is also patentable over the Tajima reference.

Claims 1, 3-4, 6, and 10-11 were rejected under 35 U.S.C. §102(b) as being allegedly anticipated by Murakami (U.S. Patent 5,452,272). The rejection is traversed.

The Examiner cites the Murakami reference as teaching optical recording media with substrates of certain thickness and as disclosing a polyurethane acrylate UV curable resin.

The arguments presented above with respect to the Tajima reference apply *mutatis mutandis* to the Murakami reference. The Murakami reference does not expressly disclose any expansion coefficient under humidity for the protective coatings therein, and there is no teaching that the materials necessarily possess all the properties recited in the pending claims. The Examiner has provided no extrinsic evidence showing that the protective coating materials of Murakami necessarily possess the claimed characteristics. While the Examiner states that “properties [of] the reference, if inherent . . . do not have to be measured and disclosed, merely inferable,” Applicants contend that the Examiner has not met his burden.

For at least the reasons discussed herein, Applicants urge that claims 1, 5, 6, 10-11 and 13-14 are patentable over the Murakami patent. In addition, Applicants contend that claim 12, which recites balancing the bending moments of the transparent substrate and the protective film and describes the positional relationship between the neutral plane and the thin film layer, is also patentable over the Murakami reference.

Applicants respectfully contend that the Murakami reference does not and cannot anticipate the pending claims.

Claims 1, 3-4, 6, and 10-11 were rejected under 35 U.S.C. §102(b) as being allegedly anticipated by Inoue (U.S. Patent 4,590,493). The rejection is traversed.

The Examiner cites the Inoue reference as teaching that “[u]rethane, epoxy, polyester and polyether acrylates are disclosed as useful and meeting the material

limitation of the claims in the instant specification at page 9, lines 16-10.” This rejection is traversed.

The arguments present above with respect to the Tajima reference apply *mutatis mutandis* to the Inoue reference. The Inoue reference does not expressly disclose any expansion coefficient under humidity for the protective coatings therein, and there is no teaching that the materials necessarily possess all the properties recited in the pending claims. The Examiner has provided no extrinsic evidence showing that the protective coating materials of Inoue necessarily possess the claimed characteristics.

For at least the reasons discussed herein, Applicants urge that claims 1, 5, 6, 10-11 and 13-14 are patentable over the Inoue patent. In addition, Applicants contend that claim 12, which recites balancing the bending moments of the transparent substrate and the protective film and describes the positional relationship between the neutral plane and the thin film layer, is also patentable over the Inoue reference.

Claims 1, 3-4, 6, and 10-11 were rejected under 35 U.S.C. §102(b) as being allegedly anticipated by Ohta (U.S. Patent 5,453,884). The Examiner cites the Ohta reference as teaching that “[u]rethane, epoxy, polyester and polyether acrylates are disclosed as useful and meeting the material limitation of the claims in the instant specification at page 9, lines 16-10.” This rejection is traversed.

The arguments present above with respect to the Tajima reference apply *mutatis mutandis* to the Ohta reference. The Ohta reference does not expressly disclose any expansion coefficient under humidity for the protective coatings therein, and there is no teaching that the materials necessarily possess all the properties recited in the pending claims. The Examiner has provided no extrinsic evidence showing that the protective coating materials of Ohta necessarily possess the claimed characteristics.

For at least the reasons discussed herein, Applicants urge that claims 1, 5, 6, 10-11 and 13-14 are patentable over the Ohta patent. In addition, Applicants contend

that claim 12, which recites balancing the bending moments of the transparent substrate and the protective film and describes the positional relationship between the neutral plane and the thin film layer, is also patentable over the Ohta reference.

Claims 1, 3-4, 6, and 10-11 were rejected under 35 U.S.C. §102(b) as being allegedly anticipated by Yokoyama (U.S. Patent 5,714,222). The Examiner states that Yokoyama teaches a “UV cured urethane-acrylate” or “epoxy-acrylate” as a coating, and further that “[u]rethane, epoxy, polyester and polyether acrylates are disclosed as useful and meeting the material limitation of the claims in the instant specification at page 9, lines 16-10.” This rejection is traversed.

The arguments present above with respect to the Tajima reference apply *mutatis mutandis* to the Yokoyama reference. The Yokoyama reference does not expressly disclose any expansion coefficient under humidity for the protective coatings therein, and there is no teaching that the materials necessarily possess all the properties recited in the pending claims. The Examiner has provided no extrinsic evidence showing that the protective coating materials of Yokoyama necessarily possess the claimed characteristics.

For at least the reasons discussed herein, Applicants urge that claims 1, 5, 6, 10-11 and 13-14 are patentable over the Yokoyama patent. In addition, Applicants contend that claim 12, which recites balancing the bending moments of the transparent substrate and the protective film and describes the positional relationship between the neutral plane and the thin film layer, is also patentable over the Yokoyama reference.

Claims 1, 3-4, 6, and 10-11 were rejected under 35 U.S.C. §102(b) as being allegedly anticipated by Yoshioka (U.S. Patent 5,674,649). The Examiner states that Yoshioka teaches a “UV cured urethane-acrylate” as a coating, and further that “[u]rethane, epoxy, polyester and polyether acrylates are disclosed as useful and meeting the material limitation of the claims in the instant specification at page 9, lines 16-10.” This rejection is traversed.

The arguments present above with respect to the Tajima reference apply *mutatis mutandis* to the Yoshioka reference. The Yoshioka reference does not expressly disclose any expansion coefficient under humidity for the protective coatings therein, and there is no teaching that the materials necessarily possess all the properties recited in the pending claims. The Examiner has provided no extrinsic evidence showing that the protective coating materials of Yoshioka necessarily possess the claimed characteristics.

For at least the reasons discussed herein, Applicants urge that claims 1, 5, 6, 10-11 and 13-14 are patentable over the Yoshioka patent. In addition, Applicants contend that claim 12, which recites balancing the bending moments of the transparent substrate and the protective film and describes the positional relationship between the neutral plane and the thin film layer, is also patentable over the Yoshioka reference.

Claims 1, 3, 4, 6 and 10-11 were rejected under 35 U.S.C. §102(b) as being allegedly anticipated by Tachibana (U.S. Patent 5,102,709). The Examiner states that Tachibana teaches a “UV cured urethane-acrylate” as a coating, and further that “[u]rethane, epoxy, polyester and polyether acrylates are disclosed as useful and meeting the material limitation of the claims in the instant specification at page 9, lines 16-10.” This rejection is traversed.

The arguments present above with respect to the Tajima reference apply *mutatis mutandis* to the Tachibana reference. The Tachibana reference does not expressly disclose any expansion coefficient under humidity for the protective coatings therein, and there is no teaching that the materials necessarily possess all the properties recited in the pending claims. The Examiner has provided no extrinsic evidence showing that the protective coating materials of Tachibana necessarily possess the claimed characteristics.

Moreover, Applicants have measured the expansion coefficient under humidity of a medium having the composition shown in Example 3 of Tachibana (see Example 3, Column 8, lines 47-61).

Example 3 of Tachibana

KAYARAD DPCA-30: 70 wt. % (described in Tachibana as a caprolactone-modified dipentaerythritol hexaacrylate)

AKAYARAD R-604: 25 wt.% (described in Tachibana as a dioxane glycol acrylate)

IRG-185: 5 wt.% (described in Tachibana as a photopolymerization initiator)

As a result of the measurement, it is found that the medium has an expansion coefficient under humidity of 5.79×10^{-5} (1/%), which is outside the claimed value of less than 5.5×10^{-5} (1/%) recited in independent claims 1, 10 and 14 (and the claims dependent thereon). This experiment provides additional support for Applicants' contention that the cited references do not necessarily disclose materials for optical data recording media having the properties of the claimed media.

For at least the reasons discussed herein, Applicants urge that claims 1, 5, 6, 10-11 and 13-14 are patentable over the Tachibana patent. In addition, Applicants contend that claim 12, which recites balancing the bending moments of the transparent substrate and the protective film and describes the positional relationship between the neutral plane and the thin film layer, is also patentable over the Tachibana reference.

In summary, none of the cited documents, taken alone or in any combination, teach or suggest optical recording media which are resistant to deformation or warpage induced by changes in relative humidity. Moreover, none of the cited documents teach or suggest that the materials used in the fabrication of the optical recording media should be selected to have low expansion coefficients under humidity

or that the expansion coefficient for the protective layer should be greater than that of the transparent substrate.

For at least the above reasons, reconsideration and withdrawal of the rejections is proper and the same is requested.

CONCLUSION


Reconsideration and allowance of claims 1, 5, 6, and 10-14 is respectfully requested in view of the foregoing discussion. This case is believed to be in condition for immediate allowance. Applicant respectfully requests early consideration and allowance of the subject application.

If for any reason a fee is required, a fee paid is inadequate or credit is owed for any excess fee paid, you are hereby authorized and requested to charge Deposit Account No. **04-1105**.

Should the Examiner wish to discuss any of the amendments and/or remarks made herein, the undersigned representative would appreciate the opportunity to do so.

Respectfully submitted,

Date: June 10, 2005
Customer No.: 21874
492949

By: 
Mark D. Russett (Reg. No. 41,281)
EDWARDS & ANGELL, LLP
P.O. Box 55874
Boston, MA 02205
(617) 439-4444